Critical Review:
Does viewing captioned or subtitled television result in improved literacy development in school-aged children?

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This critical review examines the evidence regarding captioned or subtitled television programming and its effect on literacy development in school aged children. Study designs include randomized clinical trials as well as a mixed (between and within) nonrandomized clinical trial. Overall, the published evidence suggests that viewing captioned or subtitled television programming has a positive effect on word reading in economically disadvantaged children.

Introduction

Despite the Canadian Paediatric Society's recommendations to limit screen time to less than 1-2 hours a day for school-aged children (CPS, 2012), Canadian children between 2 and 11 years of age watched an average of 27.4 hours of television a week in 2013-2014 (Canadian Radio-television and Telecommunications Commission - CRTC, 2015).

Increased time spent in front of a screen means less time interacting with print materials and engaging in literacy experiences, but this does not necessarily have to be true. One way to use television viewing as an opportunity to increase text exposure is to use closed captioning or same-language subtitles. According to CRTC standards, all broadcasters are required to provide closed captioning services, meaning that every household with a television can enhance their child's television viewing experience with context-specific, visual and auditory supported text. The current literature has suggested that captioning and subtitling in television are effective supports for vocabulary development (Linebarger, 2013) which is crucial for building a foundation for later literacy skills (Senechal, Ouelette, & Rodney, 2006).

A critical evaluation of the literature will allow speech-language pathologists to make recommendations to parents about the potential use of captions or subtitles as a simple and economical way to take advantage of television exposure to improve their child's literacy development in a motivating context.

Objectives

The primary objective of this paper is to critically evaluate the existing literature regarding the impact of captioned or subtitled television programming on literacy development. The secondary objective is to provide recommendations for clinical practice and future research.

Methods

Search Strategy

The computerized databases that were searched were Scopus, PsycINFO, and PubMed. Keywords used for database search included (caption* OR subtitle*) AND ("literacy" OR read*) AND (child*).

The search was limited to peer-reviewed articles written in English.

Reference lists of previously searched articles were also used to obtain other relevant studies.

Selection Criteria

Studies selected for this critical review met the following inclusion criteria: 1) investigated the development of literacy skills (eg. word reading and reading rate) and 2) exposed school-aged children to subtitled or captioned television programming.

Data Collection

Results of this literature search yielded three articles congruent with the aforementioned selection criteria. Two of the articles employed Level 1 research evidence studies: randomized clinical trials, and one used a Level 2 research evidence study: a nonrandomized clinical trial with a mixed (between and within-groups) design.

Results

Randomized Clinical Trials

Randomized clinical trial (RCT) designs provide a strong test of the hypothesis and can address cause and effect relationships. However, the heavily controlled conditions required in RCT studies make it difficult for

speech-language pathologists to apply the treatment strategies in a clinical practice context. Another disadvantage of RCTs are that they not always ethical. It can be argued that withholding treatment that can potentially result in improved outcomes from certain groups is unethical. Considering the kind of treatment being provided in both of the reviewed studies below, an RCT design seems appropriate.

Linebarger (2001) employed a between-groups design to determine which combination of captioning and narration while viewing a television program enhance reading skills in children who had just completed the second-grade. A final sample of 76 children participated in the study and came from schools receiving Title 1 benefits. According to the U.S. Department of Education (2004), these benefits are allocated to schools with large concentrations of low-income families to provide enrichment or remedial programs intended to support reading and math skills. Over 5 sessions spanning an 8- to 15-day period, the children viewed five 4-6 minute video clips of *Pinwheel*, a children's program aired during the early 1980s, that contained 10 target words per video. Participants were assigned to one of 4 conditions as follows: 1) video clips with captions and verbal narration; or 2) no captions and verbal narration 3) captions and no verbal narration or 4) and no captions and no verbal narration. Outcome measures included reading achievement, word recognition, reading rate, and other measures not relevant to the present question. During the first session, reading level for all participants was assessed using the reading subtest of the *Wide Range Achievement Test* (WRAT) that measured basic reading ability (recognizing and naming letters and word pronunciation out of context). After each session, the children read video scripts containing all of the target words included in the videos. This assessment measured target-specific word recognition skills and oral reading rate. A repeated measures MANCOVA was conducted to examine word recognition and oral reading rate outcome.

The results related to the primary outcome demonstrated that children who watched the video clips with captions recognized more words, but captions were found not to have an effect on oral reading rate.

The recruitment criteria used had some limitations. The schools from which the children were recruited were receiving Title 1 benefits but the researcher did not provide her rationale for choosing schools with a high population of low-income students. Furthermore, socioeconomic status was not controlled for in any of the analyses. The sample population was also relatively small and taken from only two states which affects the generalizability of the results. Another limitation was the use of researcher-developed video scripts. The scripts were written at a first-grade reading level to allow the children to focus their concentration on the higher level target words, but this affects the interpretation and generalizability of the results of the study; captions available to the public are not commonly tailored to a level just below the reading level of the audience. Strengths of this study include detailed demographic information, well-reasoned exclusion criteria, and the use of appropriate statistical analyses.

Overall, this study provides suggestive evidence that captioning in television programming is linked to improved word recognition in school-aged children.

Linebarger, Piotrowski, and Greenwood (2010) used a between-groups design to examine the relationship between viewing commercially available educational television with closed captions and reading ability in economically disadvantaged second- and third-grade. A total of 70 African American and Hispanic children were recruited. Participants were randomly assigned to one of 2 groups; each group Groups either watched six 30-minute videos either 1) with captions or 2) without captions during the after-school programs at each of the schools. General word recognition was measured by reading a list of 220 frequently occurring "Dolch" words and a list of 30 decontextualized target words taken from the six videos and scored in terms of the child's ability to read each word fluently (based on a 4-point scale). Normative code-related literacy skills (phonemic awareness and oral reading rate) were measured by two subtests of the *Dynamic Indicators of Basic Early Literacy Skills:* Nonsense Word Fluency (NWF) and Oral Reading Fluency (ORF). For the NWF subtest, credit was awarded for any correctly read sounds. For the ORF subtest, accurately read words in one minute were recorded. Both were assessed before and after video exposure. Children were also assigned to a reading risk status based on their pre-test NWF assessment: at risk for poor reading outcomes, moderately at risk, and not at risk for reading difficulties in the fourth grade. Video-specific testing followed each viewing session and outcome measures included word recognition of targets words and other measures unrelated to the present question. ANCOVAs were conducted in this study to evaluate group differences including group factors (captions v. no captions) and child risk status (at risk, moderately at risk, not at risk).

Results related to the primary outcome showed that risk status moderated word recognition outcomes as follows: children who were at risk or moderately at risk for poor reading outcomes benefited from intervention when compared to their counterparts in the no captions group whereas children in the captions group who were not at

risk outperformed their peers in the captions group. Results also found that the children watching videos with captions fluently and accurately read more Dolch words and read more nonsense words in one minute. Captions had no effect on decontextualized target word recognition or oral reading fluency.

Limitations that warrant caution about the generalizability of the study's findings include the relatively small sample size and the quiet environment in which the children viewed the captioned videos. It can be argued that the results of viewing these videos in small groups in empty classrooms cannot be transferred to a natural viewing environment in the home. Strengths of this study include detailed demographic information, appropriate statistical analyses and the use of commercially available educational television with closed captioning. It's availability to the general public improves the feasibility of the results of the study.

Overall this study provides strong suggestive evidence for using captioning services available on television programming as a support for literacy development in economically disadvantaged children, especially those who are at risk or moderately at risk for poor reading outcomes.

Nonrandomized Clinical Trial

Like RCTs, nonrandomized clinical trial designs can address cause and effect relationships. However, it is important to recognize that having nonrandomized groups can introduce systematic bias.

Kothari, Takeda, Joshi and Pandey (2002) employed a mixed design to examine the impact of subtitle exposure on word reading in school-aged Gujarati speaking children. A total of 138 children participated in the study, all of whom were from low-income families. Participants were assigned to one of 3 groups; each group spent 35 viewing sessions (30 minutes each) over three months either 1) watching Hindi film songs with subtitles 2) watching film songs without subtitles or 3) or not watching any film songs. Word reading of 1, 2, 3, and 4 syllable word blocks was measured before and after song exposure in terms of number of syllables and words read correctly. A combination of t-tests and ANOVAs were conducted, however some statistical details such as standard deviations from the mean were not reported. Reported results indicated significantly higher difference scores for the group who watched the film songs with subtitles versus the group who did not watch any film songs in reading syllables/words that were one, two and four syllables in length. Results examining sex differences revealed higher scores for females in the two-syllable condition only.

The school setting from which the children were recruited was well-described although other recruitment and demographic details were not reported. Furthermore, the lack of detail provided regarding the experiment setting makes this study difficult to replicate in future research. The method of participant assignment to each test group was not specified, although each group was described as having the same ratio of males to females. One strength of the study was the control of other potentially influential factors such as previous reading instruction by conducting the experiment in a language other than the children's language of instruction, Gujarati. The outcome measures were appropriate and well described.

Overall this study provides somewhat suggestive evidence for a link between word reading and subtitle exposure, however the lack of detail regarding data analysis and limited outcome measures warrant caution in interpretation and generalizability.

Discussion

The studies included in this review provided different levels of evidence, but overall the findings are suggestive that using captioning or subtitling while watching television improves literacy development in school-aged children. However, the limitations of these studies must be considered.

In each of the three studies reviewed, the participants recruited were exclusively from families of low socioeconomic status which restricts the generalization of the results to other populations such as children with developmental disabilities, children learning English as an additional language, etc. Future research should include a more representative sample that includes children with varying socioeconomic, developmental, and language profiles.

Also, the increasing change in preference for viewing television programming through online streaming platforms suggests that these data may be outdated. Future research will need to take into account how many hours are spent watching television that isn't broadcasted live and more generally, how screen-time hours are being allocated (time watching broadcast television vs. time watching programs though online streaming platforms). Several online streaming platforms have closed captioning options, but captioning on other screen-related media (eg. video games, Youtube videos, etc.) are not consistently accessible. This may restrict how these types of media can be used in further studies.

One of the strengths of these studies was the use of commercially available captioning services by Linebarger et al. (2010) and Kothari et al. (2002). Using captioning services that are widely available during the experimental trials rather than researcher-developed captions allows for conclusions to be made about the feasibility of implementing the use of captions and subtitles in the home. Any further research should continue using captioning services that are readily available on televisions or online streaming platforms.

Clinical Implications

Using captioning and subtitling as a support for literacy development has the potential to be an economical and widely accessible option for families who are not able to engage in typical literacy experiences with their children in the home environment. Based on the current literature, it would be appropriate to include this as a recommendation after an assessment of reading and language abilities to increase text exposure and support literacy development.

However, some caution is warranted when making recommendations for caption and subtitle use as these studies only included children from low socioeconomic backgrounds. More evidence is needed to determine whether captions and subtitles can be used with a more diverse population of children.

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